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Submission to AER

Response to consultation paper:
Demand management incentive scheme & innovation allowance mechanism

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2017

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Disclaimer:

This submission is based on the findings of the Demand Management Incentives Review (DMIR). The submission reflects the assessment and judgment of the research team only and does not necessarily represents the opinions of other stakeholders who have contributed to the study. Readers are reminded of the need to ensure that the information upon which they rely is up to date and appropriate. The authors have used all due care and skill to ensure the material is accurate at the date of this submission. ISF and the authors do not accept any responsibility for any loss that may arise by anyone relying upon its contents.

Acknowledgements:

ISF would like to express its appreciation to the Australian Renewable Energy Agency (ARENA) for funding the DMIR study.

The research team would also like to thank partner organisations and their staff who have contributed to the development of the DMIR model and this submission, both through the Study Reference Group and through stakeholder consultation events. The authors greatly value the diversity of views across the energy sector including, network businesses, Decentralised Energy Resource and Demand Management service providers, government, regulators and industry experts.

The responsibility for the contents of this submission resides with ISF.

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OVERVIEW

A pivotal reform of the Australian electricity sector

The Institute for Sustainable Futures (ISF) is very pleased to offer this response to the Australian Energy Regulator's (AER) Consultation Paper on the Demand Management Incentive Scheme and Innovation Allowance Mechanism.

ISF congratulates the AER for the thoughtful and pragmatic approach of the Consultation Paper to addressing the issue. In ISF's view, the AER's current approach represents the best chance in the history of the Australian electricity supply system to facilitate widespread, efficient and cost effective demand management (DM).

The National Electricity Market's failure to provide balanced incentives for DM has been a major "blind spot" since its establishment in in 1998 and has likely cost energy consumers hundreds of millions dollars in unnecessarily high electricity bills and excessive generation and network infrastructure spending.

Notwithstanding these major lost opportunities and "sunk costs", there are major emerging trends in the electricity sector, which mean that establishing balanced incentives for DM is now more important than ever. These major trends include:

1. The rapid growth of variable output renewable power generation such as wind and solar, for which flexible DM is likely to be the most cost-effective complement.
2. The rise in small-scale decentralised generation such as rooftop solar photovoltaics (PV), which creates both challenges and opportunities for managing energy supply and demand in the local low voltage network.
3. The rise in low-cost decentralised energy storage, in particular batteries, both in standalone units and in electric vehicles. These provide both a load and a generation resource. If well managed, batteries could deliver lower costs and greater reliability for consumers. But if not well coordinated, including through DM, these new technologies could also impose major costs to consumers and adversely impact supply reliability.
4. The emergence of smart energy management, including through the "internet of things", offers huge potential to reduce costs to consumers. The use of smart remote monitoring control of appliances and equipment (such as Demand Response Enabling Devices (DREDS), which are already installed in many air conditioners, pool pumps, water heaters etc.), in conjunction with large-scale, intelligent, consumer responsive software (as applied by UBER), could offer large cost savings for consumers and major economic development for the communities that encourage them.

These new decentralised technologies and services will best be developed by a vibrant, competitive market for DM, which will require both available supply and effective demand. The potential supply of DM services already exists. While demand for wholesale and energy market DM is gradually growing in the context of more cost reflective pricing, the demand for network DM services has to date been very limited.

Since network DM depends on detailed information related to specific network constraints, the demand can only come from network businesses. But network businesses may only be expected to create such demand where it is in their commercial interests to do so. As they are regulated monopolies, these interests are strongly driven by the incentives created by the way they are regulated.

As noted above, the future of an affordable, reliable and clean power supply in Australia depends on creating an effective network DM services market, which depends on the AER creating an effective DM Incentive Scheme.

Our study and its findings

It is crucial that network businesses face fair and balanced incentives that influence their procurement decisions. Where regulatory incentives are efficient and balanced, the network business should achieve *higher net profit*, if they undertake measures that *deliver higher net benefits* to their customers. However, if regulatory incentives are inefficient and biased, a network business may receive a lower net profit from a DM solution that delivers a higher net benefit for customers (or vice versa).

Thus, this DM Incentives Review (DMIR) was designed to test the following hypothesis:

> **DMIR STUDY HYPOTHESIS**
>
> **In situations where an NSP faces a network constraint with two equally reliable solutions – a network (capital expenditure) solution and a DM (operating expenditure) solution – the current regulatory incentives can deliver the NSP *a higher net profit from the network solution*, even in cases where the *customers would receive a higher net benefit from a DM solution*.**

The cornerstone of the DMIR was the development of a model to analyse how network businesses are financially impacted by current regulatory incentives in relation to network investment and DM options to address network constraints. That is, how these options are expected to impact their costs and revenues. The analysis was intended to identify the barriers to network businesses transitioning towards a more decentralised and service-oriented business model, and recommend appropriate incentives to address these barriers.

The key findings from the DMIR and the model are as follows:

- There are significant barriers to implementing distribution network DM solutions, including:
  1. There is a bias in favour of network capital expenditure (capex) solutions relative to DM operating expenditure (opex) solutions;
  2. Recovery of DM opex is treated less favourably than other network opex; and
  3. Future 'option value' is generally excluded when considering DM solutions.
- The second of these barriers appears to be the most significant.
- A DM Incentive Scheme should be structured in terms of dollars per kilowatt of peak demand reduction per year; that is, $\$/kW_{peak}$ per year or $\$/kVA_{peak}$ per year.
- Given the importance of DM opex cost recovery, ISF recommends a 'two-pronged' approach to a DM Incentive Scheme:
  1. "**Normalising DM cost recovery**", which treats proposed DM opex in a regulatory assessment on the same terms as capex and non-DM opex, and
  2. A **default DM Incentive Payment (DMIP)**, which provides a monetary benefit for DM opex to account for the broader benefits to consumers (on a similar basis to the

existing Efficiency Benefits Sharing Scheme (EBSS), the Capital Expenditure Sharing Scheme (CESS) and the Service Target Performance Incentive Scheme (STPIS)).

- On balance, it is probably most efficient to set a DMIP at the same level for all DM in all network territories for the entire forthcoming network regulatory determinations (2019-2025).
- The level of the DMIP should be set in the range of \$50 to \$100/kW$_{peak}$ per year.
- Payment of the DMIP to the network business should be contingent on the network business demonstrating a net benefit to customers.
- Network businesses should be permitted to claim less than the stipulated level of the DMIP where this would deliver a net benefit to customers.

RESPONSES TO AER QUESTIONS

1. Do stakeholders support our interpretation and proposed implementation of the new rules? If you have alternative views, please share these and provide supporting evidence.

Yes. However, in order to give best effect to the AER's interpretation and proposed implementation, ISF believes it is essential that, as part of the DM incentive Scheme, the AER should also act to "normalise DM cost recovery" as discussed in Section 3 below. This approach would treat proposed DM expenditure in the network businesses' five-yearly regulatory proposal on the same terms as capex and non-DM opex.

2. Do you agree with our view on the main demand management incentives (or disincentives) provided under the regulatory framework and the potential issues associated with these incentives? Please provide reasons to support any alternative views you may have.

Yes, ISF broadly agrees with the AER in relation to the main DM incentives (or disincentives) provided under the regulatory framework, subject to the following points:

- The AER is to be commended for moving to adopt total revenue caps across all network business (except ActewAGL). This has been an important reform in reducing barriers to network DM.
- ISF supports extending the Regulatory Investment Test for Distribution (RIT-D) to refurbishment and replacement projects and lowering the cost threshold for undertaking a RIT-D. However, ISF recognises that undertaking the RIT-D process is a costly exercise and has borne little fruit to date in facilitating in non-network alternatives and DM. If an effective DM Incentive Scheme is established by the AER and greater implementation of cost-effective network DM ensues, then there may be scope to significantly streamline the operation of the RIT-D.
- The AER should seek to normalise DM cost recovery to address the shortcomings in the current DM opex recovery mechanisms as discussed in Section 3 below.
- ISF recognises that the market for managing risk associated with the provision of DM is immature. However, ISF does not believe that making special dispensation within the STPIS for DM underperformance is the best way to address this. This risks DM being seen as a "second class" service, which could be detrimental to the longer-term development of the DM market. Instead, the AER should encourage network businesses to implement normal risk management strategies and avoid passing disproportionate risks onto DM service providers.
- ISF supports the AER calculating and periodically updating the value of net-market benefits for distribution network DM. As a minimum, these should be set for the:
    - Value of avoided transmission capacity (and the associated option value);
    - Value of avoided generation and storage capacity (and the associated option value); and
    - Value of avoided carbon emissions.

  Net-market benefits are discussed further in Sections 2 and 3.

3. Do you see value in exploring the net-market benefit sharing mechanism further, despite the difficulties associated with measuring net-market benefits? If yes, what detail of guidance should we provide on calculating market-wide costs and benefits? Should we (and if so, how should we) establish a method for valuing smaller demand management projects in a way that reduces the administrative burden of applying the Scheme to these projects?

Yes, ISF supports the AER exploring the net-market benefit sharing mechanism further. As noted above, net-market benefits should be considered for the following values:

1. **Value of avoided transmission capacity (and the associated option value)**

   ISF also supports extending the DM Incentive Scheme to apply to transmission networks as well as distribution network businesses. If an effective and appropriate DM Incentive Scheme were to apply to transmission network businesses then there would be no need to include a net-market benefit value for transmission capacity in setting the DM Incentive Scheme for distributions network businesses.

   The average value of avoided transmission capacity can be approximated by dividing the total transmission network business revenue by the peak demand served by these businesses. Alternatively, other estimates are available, such as the one calculated for incremental transmission cost in the report, *Building our Savings*[1]. This figure is $950/kVA_{peak}$. Once amortised over 30 years, and subject to an assumed 50% peak demand diversity factor compared to distribution networks, this equates to $35/kW/yr. ISF used this figure in the DMIR model.

2. **Value of avoided generation (and storage) capacity (and the associated option value)**

   The value of avoided generation (and storage) capacity provides a proxy for:

   - Value of reduced expected unserved energy (EUSE) in the energy wholesale market; and
   - The impacts on wholesale pool price and consequently retail energy prices.

   It was a concern over the lack of an efficient DM market in the National Electricity Market wholesale market that led the COAG Energy Council to request a rule change request to create a "demand response mechanism"[2]. The failure to implement this rule change, suggests that the underlying inefficiency remains.

   There are many ways to estimate the value of avoided generation capacity. For the purposes of the DMIR model, ISF used an estimated capital cost of open cycle gas turbines. This is estimated at $725 /kVA_{peak}$.[3] Once amortised over 30 years, and

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[1] Langham, E., Dunstan, C.,Walgenwitz, G., Denvir, P., Lederwasch, A., and Landler, J. 2010, *BUILDING OUR SAVINGS: Reduced Infrastructure Costs from Improving Building Energy Efficiency*. Prepared for the Department of Climate Change and Energy Efficiency by the Institute for Sustainable Futures, University of Technology Sydney and Energetics., https://opus.lib.uts.edu.au/bitstream/10453/16813/1/2010003238OK.pdf

[2] AEMC, *Demand Response Mechanism and Ancillary Services Unbundling: Final Determination* http://www.aemc.gov.au/Rule-Changes/Demand-Response-Mechanism/Final/AEMC-Documents/Information-sheet-%E2%80%93-Final-determination.aspx

[3] ACIL Allen Consulting, *Fuel and Technology Cost Review*, 2014 https://www.aemo.com.au/media/Fuel_and_Technology_Cost_Review_Report_ACIL_Allen.pdf

subject to an assumed 50% peak demand diversity factor compared to distribution networks, this equates to $27/kW/yr.

3. **Value of avoided carbon emissions**

   While the AER may be reluctant to include explicitly a value for avoided carbon emissions in the DM Incentive Scheme, it should as a minimum, publish an estimate of the value for avoided carbon emissions.

   The Australian Government has effectively already achieved this through auctions under the Emission Reduction Fund (ERF). The market clearing price for the most recent ERF auction was $10.69/t CO2equivlent[4]. ISF used this figure in the DMIR model.

Net-market benefits are discussed further in Section 2.

4. Since the RIT–D already requires distributors to select the option with the highest total market benefit, should we (and if so, how should we) treat RIT–D projects differently under this type of Scheme (that is, under a net market benefit sharing mechanism)?

No, ISF does not support treating RIT-D projects differently in relation to the DM Incentive Scheme.

However, as noted above and in Section 3 below, ISF strongly supports normalising cost recovery of DM expenditure. This would involve encouraging network businesses to include DM projects in their 5-year regulatory proposals, so that cost recovery for cost effective DM projects can be included in the AER/s regulatory determinations, just as it is for capex and other non-DM opex.

Where such cost recovery is included in a regulatory determination, it may be appropriate to preclude such DM projects from also receiving a DM incentive payment. However, ISF has not modelled these issues in detail. In any case, the over-riding concern should be maximising net benefit for consumers.

As noted above, ISF recognises that undertaking the RIT-D process is a costly exercise that has facilitated few non- network and DM alternatives. If an effective DM Incentive Scheme is established by the AER and greater implementation of cost effective network DM ensues, then there may be scope to significantly streamline the operation of the RIT-D. Indeed, if the DM Incentive Scheme successfully motivates the development of a vibrant network DM market, then the need for formal RIT-D obligations may be eliminated.

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[4] Australian Government Emission Reductions Fund, 4th Auction, Nov 2016, http://www.cleanenergyregulator.gov.au/ERF/Auctions-results/November-2016

5. How might we best combine the mechanisms discussed in section 6 into an option that achieves the Scheme's objective? If you prefer a mechanism that we did not discuss in section 6, please provide details on this mechanism.

The AER lists four types of mechanism:

1. Introduce targeted mechanisms to address specific perceived disincentives;
2. Internalise externalities by applying a net-market benefit sharing mechanism;
3. Incentivise distributors to promote the involvement of third party providers to undertake DM; and
4. Apply DM targets.

ISF notes that it is possible to apply any combination of these types of mechanisms, including all four mechanisms at once, within the one scheme. For example, ISF proposes a two-pronged approach to encourage all cost-effective forms of network DM, in both the short and long term. These two prongs are:

1. **Normalising DM cost recovery:** This approach treats proposed DM expenditure in the network business' five yearly regulatory proposal on the same terms as capex and non-DM opex.
2. **A default DM incentive payment (DMIP):** This approach specifies a monetary benefit payable to network businesses in recognition of the value that DM delivers to customers in reducing overall network charges and costs of electricity supply. Based on ISF's DMIR modelling analysis of a various network constraints, a default DMIP in the order of \$50 to \$100/kW$_{peak}$ per year would redress the anti-DM bias while still ensuring net benefits for customers, relative to the network capex solution. Payment of the DMIP should be facilitated annually through a revenue uplift as part of the annual network tariff approval process. Approval of the DMIP should be contingent on the network business demonstrating net benefits to customers.

This structure could easily accommodate all four of the above types of mechanisms. The proposed two-pronged DM Incentive Scheme is outlined in more detail in Section 3.

6. If you have views against applying any of the particular mechanisms discussed in section 6, please provide reasons to support this view.

While not expressing views against any of the particular mechanisms discussed, ISF would like to advise the AER that, in collaboration with all electricity network businesses, ARENA, the NSW Government, Data61, DM service providers and many other stakeholders, ISF has developed a detailed online network constraint map, Network Opportunity Map[5]. ISF recommends that the AER considers this valuable resource, before mandating additional information disclosure regarding networks constraints. (https://nationalmap.gov.au/renewables/)

[5] ISF, Introduction to Network Opportunity Maps.http://www.uts.edu.au/research-and-teaching/our-research/institute-sustainable-futures/our-research/energy-and-climate-1 ;
Online Network Opportunity Maps https://nationalmap.gov.au/renewables/

7. How we might best give effect to or enhance the information and reporting requirements discussed in section 6.5?

ISF recommends that the DMIP be structured as dollars per kilowatt (or kilovolt amp) of peak demand reduction per year; that is, $\$/kW_{peak}$ per year or $\$/kVA_{peak}$ per year.

Accordingly, performance reporting based on this metric will be critical. Other performance metrics that will be useful for monitoring network DM performance include:

- Cumulative peak demand reduction;
- Cost (annual and cumulative);
- energy saved (MWh);
- customer bills savings;
- impact on reliability (expected and actual unserved energy);
- customer satisfaction; and
- carbon emissions reduction.

1 THE DM IMPERATIVE

Electricity Demand Management (DM) means deliberate action by those responsible for electricity supply to reduce or shift demand for electricity, as an alternative to providing supply to meet that demand. DM does not include involuntary load shedding or "blackouts", or independent decisions by consumers to lower their demand or manage their energy use.

DM has great potential to reduce energy costs for consumers as well as to enhance reliability. For example, the Australian Energy Market Commission's (AEMC) 2012 Power of Choice Review[6] estimated the benefits to range between $4 billion and $12 billion (Figure 1).

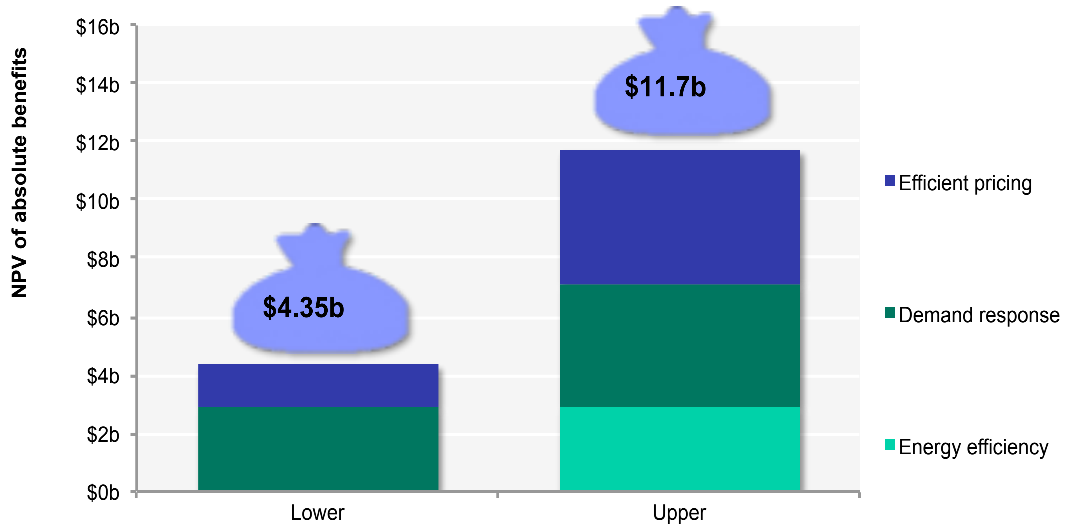

Figure 1. Benefits of demand management in the NEM (2013/14 to 2022/23)

The potential of DM to support reliable electricity supply at lower costs has been widely recognised for many decades. For example, residential off-peak water heating has been available in Victoria since the early 1930's[7]. However, this potential has seldom been embraced by policy makers, regulators and market leaders in Australia. Notable exceptions include the Demand Management Action Plan undertaken by the State Electricity Commission of Victoria between 1990 and 1994 and the Energy Conservation and Demand Management Plan established in 2009 by the Queensland Government in conjunction with that state's electricity distribution businesses[8].

Despite early good intentions that, "*Demand management … options are intended to have equal opportunity alongside conventional supply side options to satisfy future requirements*"[9], DM has been largely neglected by the architects of the Nation Electricity Market.[10]

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[6] http://www.aemc.gov.au/getattachment/2b566f4a-3c27-4b9d-9ddb-1652a691d469/Final-report.aspx

[7] Joint SECV/DITR Demand Management Project Team (Dec 1989), *Demand Management Development Program, 3 year Demand Management Action Plan, Information Paper No. 5*, (available at: http://www.efa.com.au/Library/SECVDMActionPlan.pdf) p.5.

[8] Queensland Department of Employment, Economic Development and Innovation, *Queensland Energy Management Plan*, May 2011 https://www.cabinet.qld.gov.au/documents/2011/may/qld%20energy%20management%20plan/Attachments/Qld%20Energy%20Mgt%20Plan.pdf

[9] National Grid Management Council (1992*). National Grid Protocol: First Issue* . Melbourne, NGMC, p. iii

Since its establishment in in 1998, the National Electricity Market's failure to provide balanced incentives for DM has been a major "blind spot" and has likely cost energy consumers billions of dollars in unnecessarily high electricity bills and excessive generation and network infrastructure spending.

DM can also facilitate low cost carbon emission reduction, both directly by helping consumers to reduce energy consumption, and indirectly, by providing flexible demand to complement variable output wind and solar generation.

Network DM generally involves network businesses contracting for, and otherwise supporting, decentralised energy resources (DER) as an alternative to investing in new network infrastructure. A summary of DER examples is in Figure 2 below.

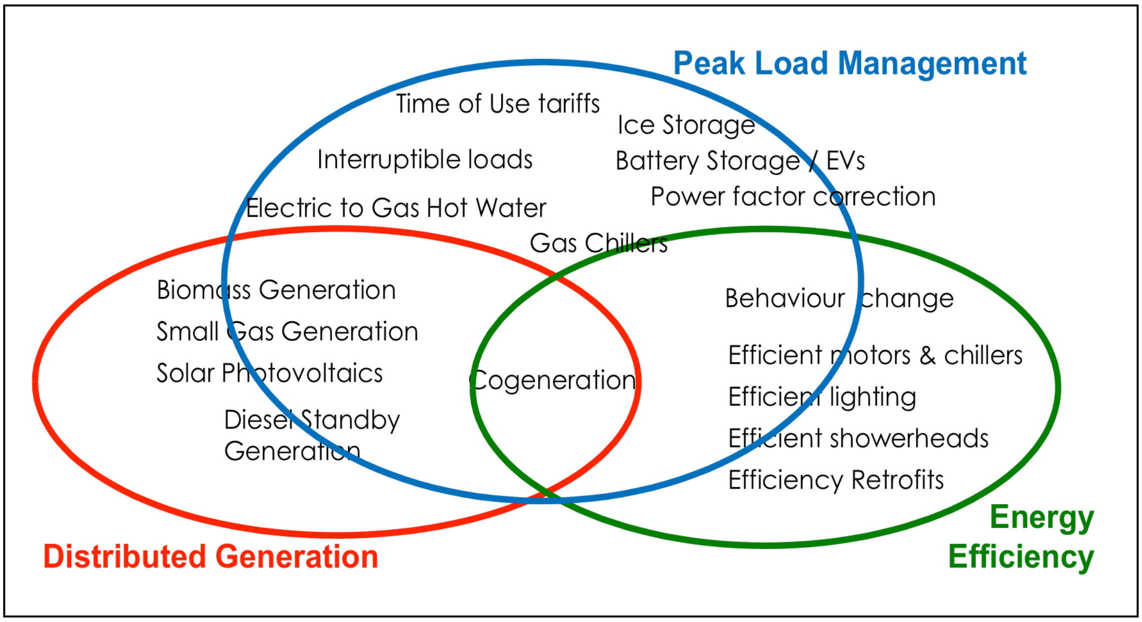

Figure 2. Decentralised Energy Resources (DER)

Network businesses are increasingly recognising the importance of supporting DER (including demand response, energy efficiency, distributed generation and storage) as a means of providing higher value, lower cost and more reliable network services for consumers. This new focus on is highlighted in the Energy Network Australia/CSIRO *Network Transformation Roadmap*[11].

The failure to date to embrace DM has come at a substantial cost to consumers, particularly in the context of over-investment in some networks. It has also led to potential inadequate capacity to respond to a high peak demand events.

The Australian Energy Regulator (AER) has a unique opportunity to redress this long-standing gap in Australia's electricity system through its DM Incentive Scheme and Innovation Allowance Mechanism.

[10] Crossley, D., *Demand-Side Participation in the Australian National Electricity Market: A Brief Annotated History,* Regulatory Assistance Project, 2011, pp.8-10

[11] http://www.energynetworks.com.au/electricity-network-transformation-roadmap

2 THE DM INCENTIVES REVIEW

Barriers to DM

It is widely recognised that there are numerous barriers to the efficient adoption of electricity DM in Australia. For example, ISF reviewed the broad barriers to DM in its report, *Institutional Barriers to Intelligent Grid*.[12] A summary of the categories of barriers to DM from this report is shown in Figure 3 below:

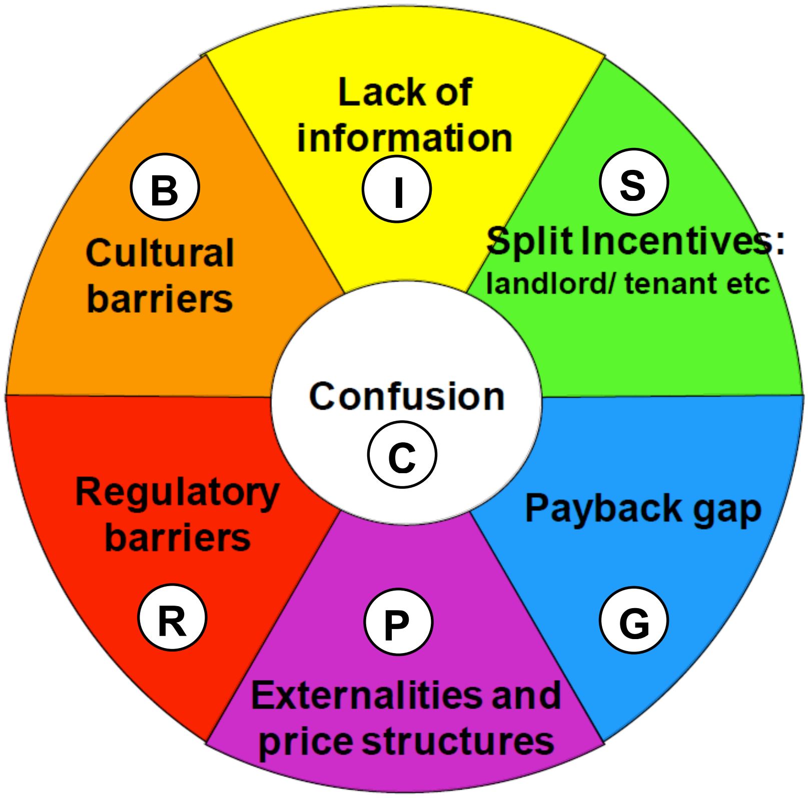

Figure 3. Barriers to electricity DM in Australia[13]

ISF also investigated these barriers further by conducting a survey of stakeholder perceptions of the degree to which these barriers obstruct the uptake of DM in the Australian electricity market[14]. The results of surveying over 200 respondents are summarised in Figure . The greater the degree of agreement with the proposed barrier, the further to the right on the scale it will be indicated. Note: the prefix letter for each listed barrier corresponds with the type of barrier listed in Figure 3.

It is noteworthy that regulatory barriers do not feature in the top seven perceived barriers in Figure 4. Furthermore, the barrier closest to the focus of this submission, *"R13. Electricity suppliers profit from electricity sold, DM cuts profits"*, drew one of the lowest levels of agreement and one of the highest divergences of views between stakeholder groups.

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[12] Dunstan, C. et al, *Institutional Barriers to Intelligent Grid*: *Working Paper 4.1, 2011*
http://igrid.net.au/sites/igrid.net.au/files/images/A2SE_ISF_DM%20Barriers%20Report%20June%202011_0.pdf

[13] Ibid.

[14] Dunstan, C., Barriers to Demand Management: A Survey of Stakeholder Perceptions, 2011, http://a2se.org.au/images/stories/files/a2se_isf_dm_barriers_report.pdf

Figure 4 Barriers to DM in Australia, (in order of level of respondent agreement, 2011)

On the other hand, seven of the top ten barriers, (P12, B19, S4, S5, R15, P11 and I3) are directly related to the behaviour of the electricity suppliers. So, while the connection may be less obvious, regulatory incentives that discourage utilities from undertaking DM are likely to have a powerful impact on limiting the uptake of DM.

The DM Incentives Review

As part of its 2012 Power of Choice Review, the AEMC recognised that regulatory incentives faced by network businesses were crucial to the development of an efficient DM market and so recommended changing the National Electricity Rules to strengthen such incentives. This rule change was adopted in 2015, giving the AER responsibility for creating an effective DM Incentive Scheme and Innovation Allowance.

In the context of the AER developing this new DM Incentive Scheme, the Australian Renewable Energy Agency (ARENA) commissioned ISF to undertake a DM Incentive Review (DMIR) to assess quantitatively the financial barriers to distribution network DM driven by existing economic regulatory incentives.

To investigate the impact of incentives, ISF developed a detailed spreadsheet model (the DMIR model). The DMIR model examines four different network constraints cases and one network infrastructure solution and one DM solution for each. The four cases are set out in Table 1.

Table 1 Cases considered in the DMIR model

Case	Network Constraint	Network Solution	DM Solution
1	Urban regional high voltage (HV) cables, reaching end of service life	Retire aging 33kV cables – Replace with 132KV cable (capacity: 200MWp, cost: $300M)	Large scale energy efficiency and peak load mgt (capacity: 50MWp, cost: $132/kW/yr, 5 year deferral)
2	Over- and under-voltage on distribution feeder	Install power factor correction, Static VAR Compensation and Distribution Transformer Automatic Tap Changers (capacity: 0.5MWp, cost: $0.5M)	Peak load mgt, local batteries and network support (incl. from PV inverters) (capacity: 0.5MWp, cost: $143/kW/yr, 30 year deferral)
3	Distribution zone approaching capacity on urban fringe	New zone substation for new residential estate (capacity: 10MWp, cost: $30M)	Establish minigrid (energy efficiency, load mgt, PV, batteries & diesel back up) for new subdivision; maintain connection to main grid (capacity: 10MWp, cost: $113/kW/yr, 30 year deferral)
4	Unreliable distribution feeder to community on rural fringe-of-grid	Retire existing feeder - replace like for like (capacity: 5MWp, cost: $5M)	Establish minigrid (energy efficiency, load mgt, PV, batteries & diesel back up) - keep existing feeder as back up (capacity: 5MWp, cost: $113/kW/yr, 30 year deferral)

It is important to stress that the purpose of the model is *NOT* to examine the relative economic merits of DM solutions compared to network solutions. While this is an important question that deserves more attention, it is not the issue at hand here. Rather, the purpose of this analysis is to ask whether, in circumstances where DM *would* deliver a lower cost and higher value to customers, does the current regulatory system creates financial disincentives to network businesses choosing DM.

The data used in the model is hypothetical, but ISF sought real world references and precedents wherever available so that the data is as plausible as possible. The model conducts net present value benefit/cost analysis over 5-year and 30-year timeframes, approximating a single regulatory period and a typical network asset lifetime.

The DM solutions draw on the following decentralised energy resources:

1. Peak load management (DSR, Dynamic Peak Pricing, Controlled load, etc);
2. Energy efficiency;
3. Battery storage;
4. Dispatchable local generation; and
5. (Local) Variable renewable generation.

The regulatory parameters include:

1. Key inputs: discount rate, weighted average cost of capital (WACC), tax rate, cost of debt, return on equity and Value of Customer Reliability (VCR)
2. Key regulatory features: depreciation, capital expenditure (capex) rollover to Regulatory Asset Base (RAB), operating expenditure (opex) recovery, reductions in expected unserved energy (EUSE)
3. Incentive mechanism considered include:
    - STPIS - Service Target Performance Incentive Scheme
    - EBSS - Efficiency Benefit Sharing Scheme
    - CESS - Capital Expenditure Sharing Scheme
4. Net-market benefits (that is benefits that accrue to stakeholders other than directly to distribution network businesses and their customers) considered include:
    - Value of avoided transmission, generation and storage capacity;
    - Value of avoided carbon emissions; and
    - Option Value.

   Please note: These factors were quantified but generally ***not*** included in the cost-benefit analysis, except where explicitly stated.
5. Net-market benefits that were not considered include:
    - Value of customer energy savings (i.e. other than distribution network charges);
    - Value of non-network reduced EUSE; and
    - Impacts on wholesale pool prices.

As the time and budget available for the study was very limited, ISF was not able to conduct as comprehensive a modelling exercise at it would have liked. In some cases, compromises in method and data collection were required to complete the analysis within the available time. There are numerous remaining relevant and interesting issues that ISF would like to examine further if time and resources were made available.

The outputs of the DMIR model focused on:

- The benefits and costs accruing to customers;
- The revenue, costs and net profit accruing to the network businesses; and
- The return on assets for network businesses[15].

These values were calculated for both the network (capex) solution and the DM (opex) solution, using no action to address the network constraint as the common point of reference.

These two perspectives (network businesses and customers) and two solutions (network capex and DM opex) were then presented in graphical format for each of the four cases and for both 5-year and 30-year time horizons. An example of these graphs is shown in Figure 5.

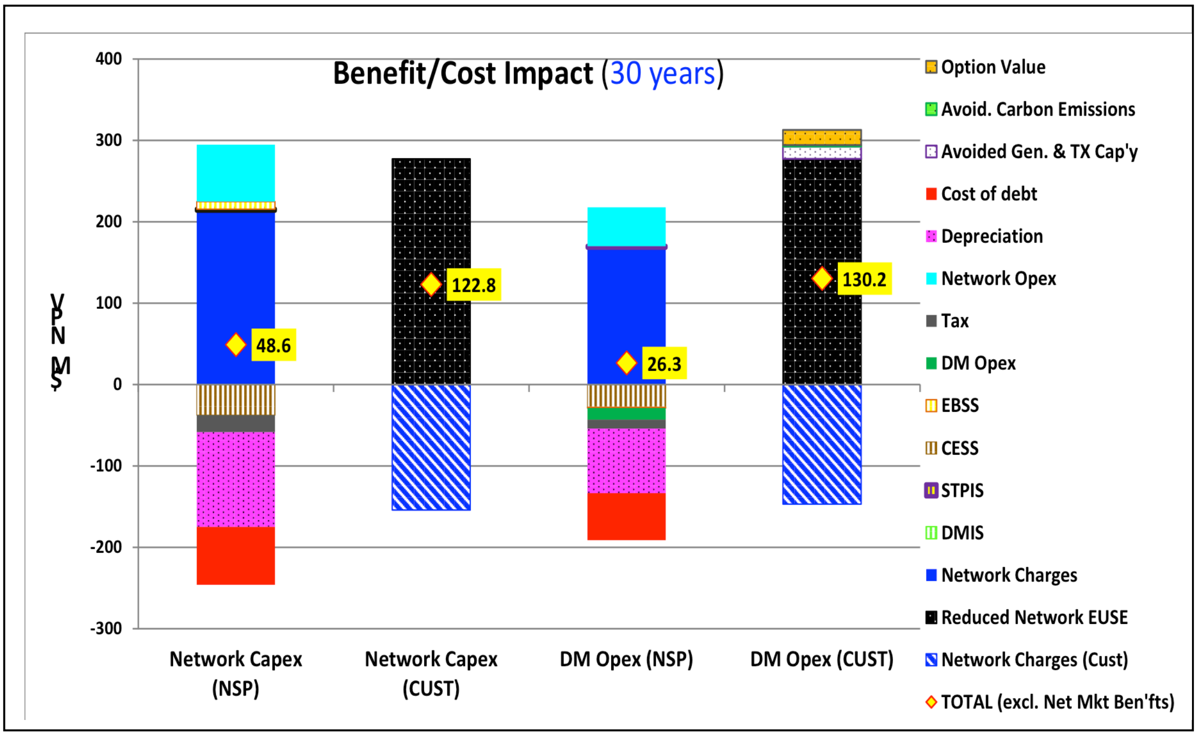

Figure 5. Cost-benefit analysis *without* DM cost recovery (Case 1: 30 year perspective)

Further detail on the DMIR study scope is included in Appendix A.

A screen shot of the model dashboard is included in Appendix B.

Appendix C includes a summary of the results of the DMIR modelling for each Case with a zero DMIP, and key sensitivity analyses, including estimates of breakeven levels for the DMIP needed to neutralise the current regulatory bias.

ISF would be very pleased to provide the full DMIR spreadsheet model to the AER for its review and consideration.

15 The return on assets for network businesses was calculated as a modified internal rate of return for network business over 30 years based on equity invested, equity returned and net profit received- using the regulated nominal pre-tax return on equity as both the finance rate and the reinvestment rate.

As illustrated in Figure 5, for Case 1 for the 30-year horizon, the DM opex solution delivers lower costs and higher net benefits ($130.2 million) to customers than the network capex solution ($122.8 million). If the regulatory system was working efficiently, the network business would be incentivised to adopt the DM solution to the network constraint. However, from the network business's perspective, the more profitable option is the network capex solution ($48.6 million net profit compared to only $26.3 million net profit for the DM opex solution). If return on equity for the network business is considered as the decisive parameter, instead of net profit, this also favours the network capex solution (10.0%), compared to the DM opex solution (9.2%).

The results varied considerably across the cases, but the overall pattern across all the 30-year cases is quite consistent. ISF also varied a range of parameters to test sensitivity to differing inputs. There remains a consistent bias in favour of network capex and against DM, regardless of:

- whether DM costs are higher or lower (and consequently whether network capex is more or less expensive than the DM solution);
- whether net-market benefits are include or excluded; and
- whether the debt to equity ratio is higher or lower.

Consequently, the DMIR modelling found strong evidence that there are significant financial barriers to network DM in the existing regulatory structure. Based on further analysis, these barriers we found to include:

a. A bias in favour of capex e.g. network infrastructure, relative to opex;

b. Less favourable treatment of DM opex recovery, compared to capex and other opex;

c. An exclusion of future "option value" when considering DM solutions. For example, undertaking DM to defer expensive capex may lead to major savings in the future if demand conditions change so that the capex is no longer required. (Note however, that this barrier is not an intrinsic element of the current regulatory system, but a consequence of how the current regulations are applied.)

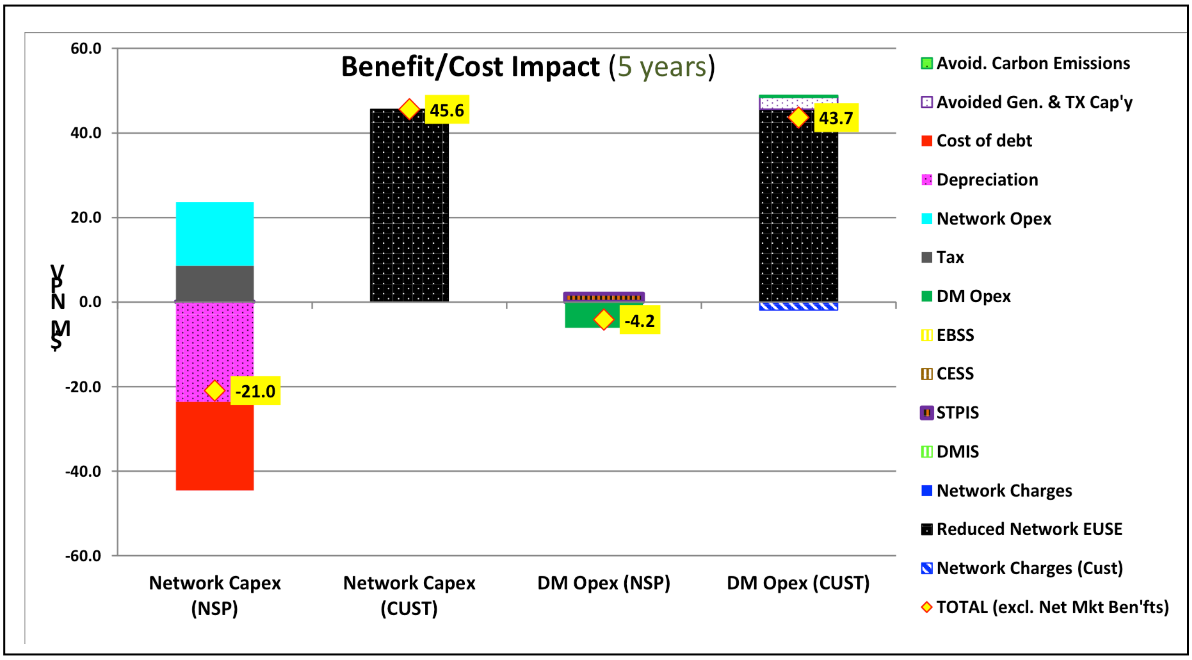

Figure 6. Benefit cost analysis *without* DM cost recovery (Case 1: 5 year perspective)

It should be noted that, as illustrated in Figure 6, these patterns of bias were not generally apparent when considering the short term, 5-year time horizon. This emphasises the importance of long term cost recovery issues when considering the regulatory incentives.

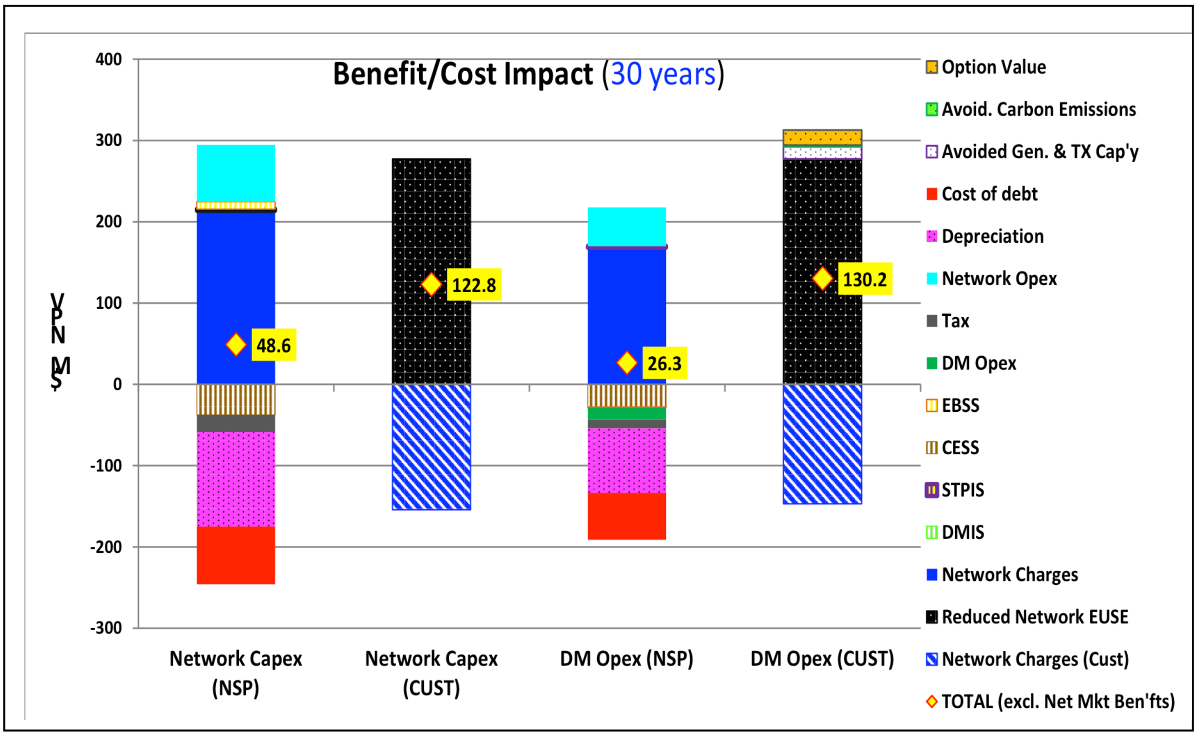

Figure 7. Benefit cost analysis *without* DM cost recovery (Case 1: 30 year perspective)

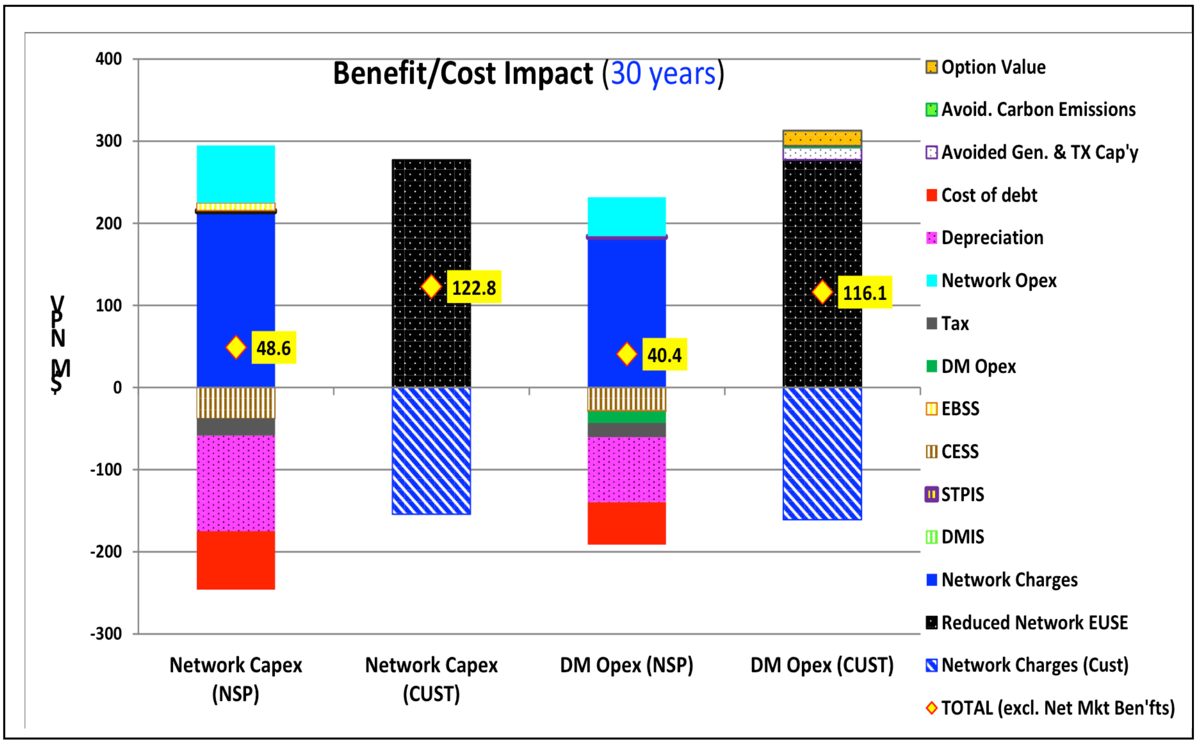

Figure 8. Benefit cost analysis *with* DM cost recovery (Case 1: 30 year perspective)

As illustrated in Figure 7 and Figure 8, the most significant, but not the only, barrier appears to be the **relatively unfavourable treatment of recovering DM opex** relative to network capex and other non-DM network opex.

Typically, network capex and non-DM opex is justifiable where it is shown to improve customer reliability and reduce EUSE. By contrast, DM opex is typically only justifiable where it is shown to cost effectively avoid or defer network capex.

The impact of the capex bias depends largely on the extent to which the regulated cost of capital exceeds that *actual* cost of capital. This bias may be significant, but it was beyond the scope of the study to investigate this element.

The impact of neglecting the options value of network DM could also be very significant and is particularly relevant to the reported over-investment in network capacity by some network businesses in recent years. However, it was also beyond the scope of the study to investigate option value in detail.

In addition to these regulatory barriers for network businesses, the accounting of net-market benefits (or lack thereof) also creates a barrier to network DM, including:

1. The net-market benefits associated with avoided transmission, generation and storage capacity that may be avoided, which would manifest in lower electricity pool prices, less chance of shortage of supply in peak periods, and the option value associated with potentially avoidable future transmission, generation and storage costs; and
2. The net-market benefits associated with avoided carbon emissions.

Given the very active public debate surrounding the billions of dollars of new expenditure (including possible public and customer funding) proposed for new transmission, generation and storage capacity and carbon emission abatement, it is crucial that the AER publicly consider and address these net-market benefits.

As noted in Figure 3, there are other barriers to network DM outside the regulatory incentives considered by the DMIR. It is likely that the existing regulatory disincentives to DM have served to entrench and reinforce these other non-regulatory barriers, and a well-designed DM Incentive Scheme should help to redress these other barriers over time. As a minimum, the AER should use the DM Incentive Scheme to remove the existing regulatory barriers. However, there is also a strong case to support the AER “over-compensating” for the existing regulatory bias in the short to medium term, in order to more rapidly to address the other non-regulatory barriers to DM.

While our analysis identified significant barriers to network DM both in the regulatory structure and elsewhere, it did not find that these are necessarily a permanent feature of the electricity market. Accordingly, if the DM Incentive Scheme can address these barriers in the short to medium term (say, over two regulatory periods), then it may not need to be a permanent feature of the regulatory landscape.

3 DESIGNING THE DMIS

Principles and metrics for a DM Incentive Scheme

ISF supports the DM Incentive Scheme objective and assessment criteria in the National Electricity Rules and proposes a set of principles on which the scheme should be based.

The DM Incentive Scheme should:

1. Maximise long-term benefits for consumers;
2. Enhance competition, in particular by allowing DM to compete fairly with network options;
3. Ensure that incentives are sufficient to develop an effective DM market;
4. Encourage efficient delivery of DM at low cost;
5. Require transparent information provision and reporting; and
6. Include a holistic consideration of all relevant benefits, including net-market benefits beyond those directly related to the distribution network businesses.

Relevant net-market benefits that should be considered include the:

- value of deferred or avoided of transmission, generation and storage capacity;
- option value of potentially avoidable future network, generation and storage costs; and
- value of avoided carbon emissions.

As the major driver of costs for electricity network businesses is annual peak demand, the performance measure for the DM Incentive Scheme should be reducing annual peak demand on the network. **Accordingly, an incentive should be structured as dollars per kilowatt** (or kilovolt amp) **of peak demand reduction per year, that is, $/kW$_{peak}$ per year, or $/kVA$_{peak}$ per year.**

Other performance metrics that will be useful for monitoring network DM performance include:

- cumulative peak demand reduction;
- cost (annual and cumulative);
- energy saved (MWh);
- customer bills savings;
- impact on reliability (expected and actual unserved energy);
- customer satisfaction; and
- carbon emissions reduction.

Proposed structure of a DM Incentive Scheme

Given the importance of recovering the cost of DM opex, ISF proposes that the structure of the DM Incentive Scheme directly address this particular bias. To encourage all cost-effective forms of network DM, in both the short and long term, ISF recommends that the AER include two parallel approaches (or equivalent mechanisms) in the scheme:

1. **Normalising DM cost recovery:** This approach treats proposed DM expenditure in the network business' five yearly regulatory proposal on the same terms as capex and non-DM opex.
2. **A default DM Incentive Payment (DMIP):** This approach specifies a monetary benefit payable to network businesses to recognise the value that DM delivers to customers in reducing overall network charges and costs of electricity supply.

The proposed "two-pronged" DM Incentive Scheme is outlined in more detail below.

Normalising DM cost recovery

The DM Incentive Scheme should be developed as a coordinated strategy to encourage cost effective DM as a normal part of running a network business i.e. as normal business expenditure. The scheme should not be regarded as simply an incentive payment to respond to existing biases and barriers to DM. This approach involves the AER treating DM opex proposed in the network business' five yearly regulatory proposal on the same terms as capex and non-DM opex.

To implement this approach, the AER should encourage network businesses to develop a detailed 5-year DM Plan as part of their regulatory proposal. A DM Plan should identify DM solutions to address network constraints and provide a business case to evidence the solutions' cost effectiveness. Cost effectiveness could be demonstrated ***either*** by reference to avoided or deferred network capex ***or*** by reference to other factors that are conventionally used to justify network capex or non-DM opex. These other justifications include specific, quantified customer benefits in service improvements or reductions in EUSE.

Given that this is a new approach to planning DM, the AER should give clear, timely guidance to network business on what information is required for DM Plans. Information requirements should be no more onerous than for other proposed network expenditure.

DM Plans should include both price-based DM and non price-based DM. There should be *no cap* on the allowable cost of DM in aggregate, or on a $/kW per year basis, but all DM measures included should be cost effective and demonstrate net benefits to consumers. DM Plans should be subject to the same review processes as other proposed capex and opex. It is recognised that the AER may need to draw on specialised DM consulting expertise to undertake such DM expenditure reviews, just as it does for the capex and opex expenditure reviews.

Where the AER approves the proposed DM expenditure (for example, as an alternative to a more costly network capex solution), then the associated DM opex should be added to the network allowable opex for the forthcoming regulatory period. Where the proposed DM expenditure is rejected, then the cost of the network capex solution should be added to the network business' allowable capex. (Such capex should, of course, of course be subject the normal expenditure review process.)

If a network business does not submit any proposed DM projects as part of a DM plan, then the network business should still be able to claim a degree of cost recovery, but this would be limited to the level of the DMIP.

Note: While normalising DM opex and requiring DM Plans will help to address the unequal treatment of DM opex recovery, it will do little or nothing to address the capex/opex bias, and other non-financial barriers. The capex/opex bias is addressed in the second "prong" of the proposed incentive.

The DM Incentive Payment (DMIP)

One of the advantages of DM is its ability to be deployed more flexibly, in smaller "lumps" and with shorter lead-time in response to changing demand conditions. It is therefore impractical and inefficient to expect networks to plan all DM activity many years in advance. This is particularly relevant where network businesses have limited experience and expertise in procuring network DM and where technology is developing rapidly. Therefore, a complementary mechanism is required: a default incentive payment.

The DMIP recognises (and monetises) the value DM delivers to customers by reducing overall network changes and costs of electricity supply. The payment mechanism could be similar to the existing Efficiency Benefits Sharing Scheme (EBSS), the Capital Expenditure Sharing Scheme (CESS) and the Service Target Performance Incentive Scheme (STPIS), which also offer financial benefits to network businesses in return for delivering greater benefits to consumers.

A DMIP should be set at a level that is sufficient to motivate uptake of network DM by the network businesses (without which there would be no benefits to share with customers), while still delivering maximum benefits to consumers. It is not possible to determine a "perfect level" in advance as the benefits available from DM depend on the nature of the network constraint and cost of the available network and DM solutions.

However, it would be cumbersome, costly and inefficient to determine the appropriate level of a DMIP for each network constraint, in each location, for each network business. It is likely to be most efficient to set the incentive payment at a same level for all DM in all network territories for the duration of the forthcoming network regulatory determinations (2019-2025) i.e. agree on a **default** DMIP.

Setting the level of the DMIP

One possible approach for a DMIP would be to apply the same proportional benefit sharing as currently applies to the EBSS and the CESS; that is, a 30% share to network business and 70% to customers. Since the DM Incentive Scheme must encourage cost effective DM, the average cost of DM should be less than, or equal to, the average cost of network capacity. The long run average cost of network capacity (measured in $/kW$_{peak}$ per year) can be estimated by dividing the total annual cost of providing network services (that is, total annual network revenue) by the peak demand being served each year.

Example calculation of a default DMIP

The long run average cost of capacity for New South Wales network businesses gives a range from \$170/kW$_{peak}$ per year for Endeavour Energy, to about \$330/kW$_{peak}$ per year for Essential Energy with a weighted average of \$250 kW$_{peak}$ per year. Applying the 30% network share of these avoided costs gives a range of approximately \$50 to \$100/kW$_{peak}$ per year and an average of about \$75/kW$_{peak}$ per year. The figures for other states and territories will vary, but are likely to fit broadly within this range. This provides a reasonable rule of thumb for the scale of an incentive payment.

As noted above, it is essential that the DMIP is sufficient to motivate network DM by the network businesses. Without such action there are no benefits to share with customers. It was beyond the scope of the study to ascertain an accurate estimate of what the *minimum* level of an incentive payment would need to be to motivate action, however anecdotal feedback during consultation around the study, has suggested that a DMIP below \$40-\$50 /kW$_{peak}$ per year (roughly 20% of the average cost of distribution network services) would be unlikely to motivate network business. While this seems like a plausible minimum level, it is not based on solid evidence and it is recommended that the AER conduct further investigations to establish a minimum motivating level.

As to the maximum level payable, ISF analysis can provide clearer guidance. The maximum DMIP should be set at the breakeven point where the net benefits to customers for the DM solution equals the net benefits to customers for the network capex solution. Below this level, customers will benefit from DM and above this level customers will lose.

According to the DMIR modelling across our four cases, the maximum level (in \$/kW$_{peak}$ per year) for a DMIP varies as follows[16]:

In the absence of normalising DM cost recovery:

- Between \$30 and \$183 if net-market benefits are excluded; and
- Between \$113 and \$385 if net-market benefits are included.

If normalising DM cost recovery is applied:

- Between zero and \$70 if net-market benefits are excluded; and
- Between zero and \$272 if net-market benefits are included.

These figures represent a wide range, and if further cases were examined the range may well become even wider. However, it is apparent from these figures that, in many cases, there is ample scope to provide a motivating DMIP for network business, while still leaving significant net benefits for customers to enjoy. (It should also be emphasised that the DMIP should only be payable to network businesses where they have demonstrated a net benefit to consumers, so the risk of consumers being left worse off is minimised.)

It is also clear from the analysis that a lower DMIP can be adopted if normalising DM cost recovery is applied. Similarly, a higher DMIP can be adopted if net-market benefits are included in the assessment.

16 For more information, please refer to Appendix C.

Recognising that the lower the level of the DMIP, the greater the benefits of DM accruing to customers, a reasonably low upper limit to the possible range for the DMIP should be adopted, subject to the comments above about motivating network DM in the first place.

Based on the available evidence and ISF's DMIR analysis of various network constraints, a default DMIP should be set in the range from $50 to $100/kW$_{peak}$ per year in order to stimulate cost effective network DM while still ensuring significant net benefits for customers.

Such a DMIP would be broadly consistent with the level for DM incentives in other jurisdictions. For example, in Ontario, the peak demand related component of their conservation and demand management (CDM) incentive ranges between CAD$13.50 and CAD$81/kW$_{peak}$ per year.[17]

Provided the above two-pronged approach is adopted, it is likely that a DMIP could be set closer to the lower end of this range, since network businesses will be able to propose and recover the cost of higher cost DM solutions (that are still cost-effective!). However, if the two-pronged approach is not adopted, and the current bias against DM opex recovery is retained, the DMIP may need to be set closer to the upper end of this range.

In order to reinforce the principle of efficient procurement and delivery of DM, network businesses should demonstrate a net benefit to customers to be eligible for the incentive payment. According to this criterion, network businesses should demonstrate both that the DM solution is *expected* to deliver net benefits to consumers and that the project has met these expectations *in practice*.

Network businesses should also be permitted to claim less than the stipulated level of the DMIP where this would deliver a net benefit to customers.

Timing of delivery and recovery of the DMIP

Payment of the DMIP should be facilitated annually through a revenue uplift, as part of the annual network tariff approval process. Approval for the DMIP should be contingent on the network business demonstrating net benefits to customers.

Annual payment would be more resource intensive for both the network businesses and the AER, but in order to develop the expertise and understanding of network DM across the sector and to deliver the benefits of DM to customers without unnecessary delay, such an investment of resources is likely to be more than justified.

Including price-based DM

Some of the most effective, low cost and innovative DM measures will include a combination of both price-based and non price-based DM. Such efficient approaches to DM should be encouraged by the DM Incentive Scheme, rather than excluded. Applying the proposed two-pronged approach removes the need to preclude price-based DM. It is anticipated that most price-based DM would largely be covered in the proposed DM Plans, and complementary to the network business' existing Cost Reflective Network Pricing strategy.

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[17] Macdonald, C. , *Power Stream Application for a CDM Performance Incentive Payment to Ontario Energy Board*, 2016 http://www.rds.ontarioenergyboard.ca/webdrawer/webdrawer.dll/webdrawer/rec/526430/view/

4 COMPETITION IN DM SERVICES

The AER has suggested "enhancing competition" as an additional criterion in giving effect to the rules relating to the DM Incentive Scheme. ISF strongly supports this additional criterion, provided that it always serves the purpose of the improving outcomes for all customers, and vulnerable customers in particular.

There is very little competition in the Australian network DM market as there is currently little demand from network businesses for these services. Network DM depends on detailed information regarding network conditions and the timing, scale and nature of the network constraint. Moreover, given the adoption of the final ring-fencing guidelines, the network business will normally need to contract with a third-party provider of DM services.

Simply regulating, or directing, the network business to provide information to the market or to contract for cost-effective DM services is very unlikely to develop the DM services. This is particularly so in the current regulatory environment where there is evidence through the DMIR modelling that it is contrary to the network business' financial interest to do so.

Thus, in these circumstances, it is very difficult to develop an effective DM market unless the network is incentivised to do so.

It is desirable to develop a vibrant, efficient and competitive market for network DM services, particularly in the context of the rapid development of the decentralised energy technologies. To this end, network businesses should be encouraged by the DM Incentive Scheme to procure network DM services from a range of DM service providers.

DERs that provide DM services to network businesses are also likely to be able to provide DM services, now or in the future, to other parts of the electricity market, such as to the market operator as ancillary services, and to retailers and pool price exposed customers as a hedge against high price events. It is therefore important that contractual arrangements for providing DM services to network businesses do not preclude the business from providing these services to other parties, as some anecdotal evidence suggests may have occurred.

It should also be noted that accounting for net-market benefits in a DM Incentive Scheme in no way reduces the availability of these benefits to other market participants, for two reasons. Firstly, the benefits considered above (value of transmission, generation and storage capacity, option value and value of avoided carbon emissions) are generally unavailable to other parties at present. Secondly, even if this were not the case, an allowance for net-market benefits included in a DM Incentive Scheme would be funded by all network customers, rather than by those seeking to access these other net-market benefits.

5 DM INNOVATION ALLOWANCE

This submission is not intended to address DM Innovation Allowance, which was outside the scope of the DMIR study. However, ISF offers the following brief comments as being relevant to issue of the DM Incentive Scheme.

ISF supports the AER in its conclusion that the existing innovation allowance "has not been effective in encouraging an efficient level of demand management activity". ISF strongly supports providing funding for innovative DM projects and research through mechanisms like a DM Innovation Allowance. However, it is also plausible that to date, the current allowance has actually been counterproductive to the development of DM by:

- signalling to network businesses and others that the AER regards DM as small-scale, immature and uncommercial;
- distracting network businesses and the AER from less "innovative" and more cost effective opportunities for DM; and
- confining funding of network DM research to network business only.

As outlined by the AER, competition is a key driver of innovation. ISF agrees that the DM Innovation Allowance may have been more successful if the funding was more open to competitive bids. ISF suggests that the DM Innovation Allowance funds from network businesses be pooled and made available on a competitive basis including among network businesses.

ISF suggests that the AER draw on the following lessons from its experience of the DM Incentive Allowance, when developing a DM Incentive Scheme:

- DM needs to be treated as a serious resource for assisting the network business to provide services to their customers.
- Available expenditure and cost recovery for network DM needs to be commensurate with the scale of the opportunity.
- Transparent, consistent and effective measurement, verification and reporting of performance is crucial. This needs to be focussed on maximising benefits for consumers. Reporting structures should be in place to ensure that future projects deliver the pipeline of future impactful DM initiatives, and facilitate knowledge sharing.

APPENDICES

APPENDIX A: THE DMIR STUDY

It is clear that network businesses will need to ensure an efficient balance between centralised and decentralised energy resources, and between network and non-network options, including demand management (DM). In principle, network businesses are already required to ensure a balanced approach to network investment and DM through their "Demand Side Engagement Strategies" and in particular, through their Regulatory Investment Test (RIT) process. However, the extent to which networks businesses undertake DM and directly support DER is variable and depends in part on ring-fencing provisions. In any case, network businesses are a pivotal party in expanding the focus of electricity sector investment to include DER alternatives via DM.

It is therefore essential that network businesses face fair and balanced incentives in making their procurement decisions. If regulatory incentives are efficient, the business should achieve *higher net profit*, if they undertake measures that *deliver* ***higher*** *net benefits* to their customers. However, if regulatory incentives are inefficient and biased, a network business may achieve a lower net profit from a DM (opex) solution that delivers a higher net benefit for customers (or vice versa).

Thus, the DM Incentives Review (DMIR) was designed to test the following hypothesis.

<u>HYPOTHESIS</u>

In a situation where a network business faces a network constraint with two equally reliable solutions – a network (capex) and a DM (opex) solution – the regulatory incentives will allow the network business to achieve *a higher net profit from the capex solution*, even in the case that *the opex solution delivers higher net benefit for customers*.

The DMIR investigated the following research questions in order to test the hypothesis:

- Are current network regulatory incentives for DM fit for purpose to deliver least cost, reliable outcomes for electricity consumers?
- If not, how should these regulatory incentives change?
- How should network businesses compare DER with network options to maximise overall value for electricity consumers?

THE STUDY

The DMIR concept was developed through a structured A-Lab 'incubation' process, driven by the Australian Renewable Energy Agency (ARENA). The co-design team included: the A-Lab facilitator; the University of Technology Sydney's Institute for Sustainable Futures (ISF); the Energy Networks Australia (ENA); two network core partners; three DER providers; and other consultants. The outcome of the process was the structure outlined in Figure 9.

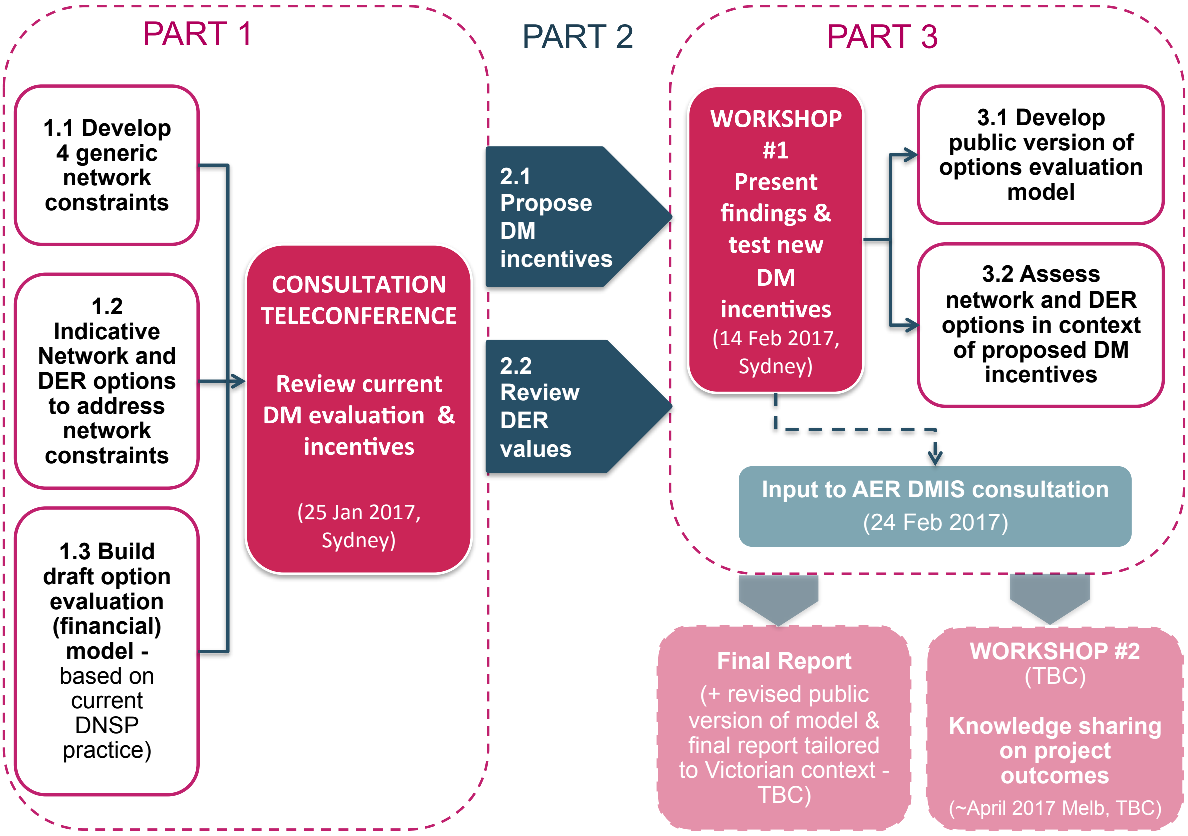


Figure 9. DMIR study concept

The study addressed the practical financial challenges in the regulatory landscape faced by network businesses when considering greater uptake of DER and more active DM through three parts:

1. A stocktake of network regulatory incentives for DM;
2. Designing efficient DM incentives for DER; and
3. Evaluating DER for networks.

THE MODEL

The cornerstone of the DMIR was the development of the DMIR model to analyse how network businesses currently assess network investment and DM options to address network constraints i.e. *how these options are expected to impact their costs and revenues*. The findings of the analysis were intended to directly identify the barriers to network businesses transitioning towards a more decentralised and service-oriented business model.

The modelling followed the path outlined in Figure 10.

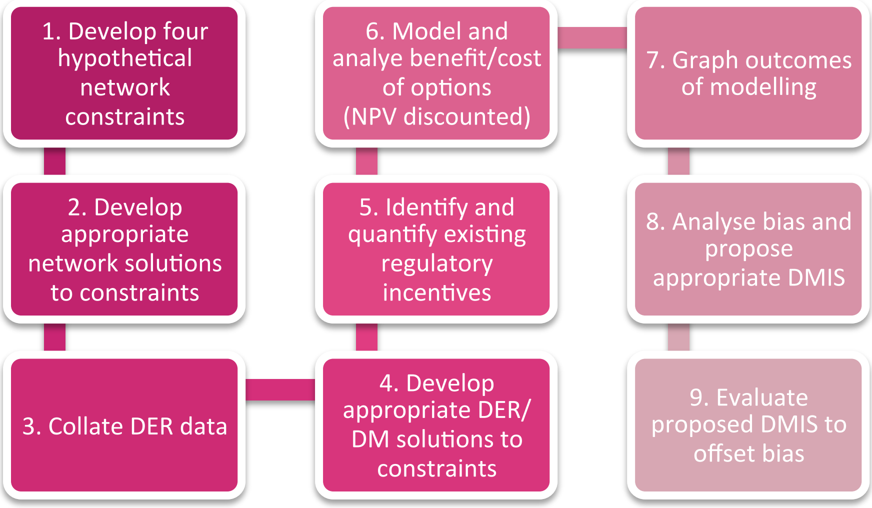


Figure 10. DMIR modelling method

The model:

- accounts for capex, opex, debt, equity, depreciation and tax;
- includes the EBSS, CESS, STPIS and a proposed DM Incentive Scheme[18];
- accounts for reliability via impacts on Expected Unserved Energy (EUSE);
- considers load growth over time; and
- includes estimated values for net-market benefits, but does not include these in the cost-benefit analysis, except where explicitly stated for complementary analysis.

[18] EBSS = Efficiency Benefit Sharing Scheme; CESS = Capital Expenditure Sharing Scheme; STPIS = Service Target Performance Incentive Scheme; DMIS = Demand Management Incentive Scheme

APPENDIX B: DMIR MODEL DASHBOARD

DMIR Model DASHBOARD

INSTRUCTIONS Select case from drop down menu & adjust input parameters in green cells.

Restore Defaults

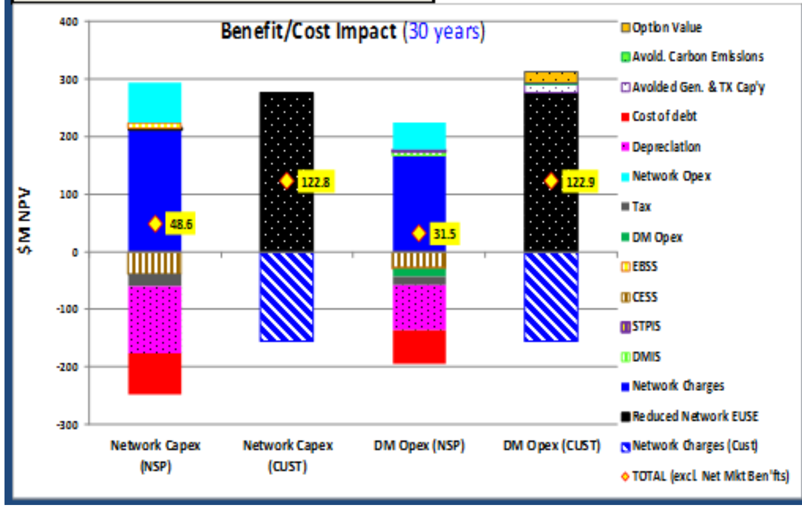
Select Case 1

	Name	Description	
Constraint Scenari	Aging Urban Regional HV Cables		IRR
Network Solution	Replace HV Cables	Install 132KV cable, retire existing 33kV	10.0%
DM Solution	Large scale En Effic. and Load Mgt	Mixed DM- 5 year cable deferra	9.5%

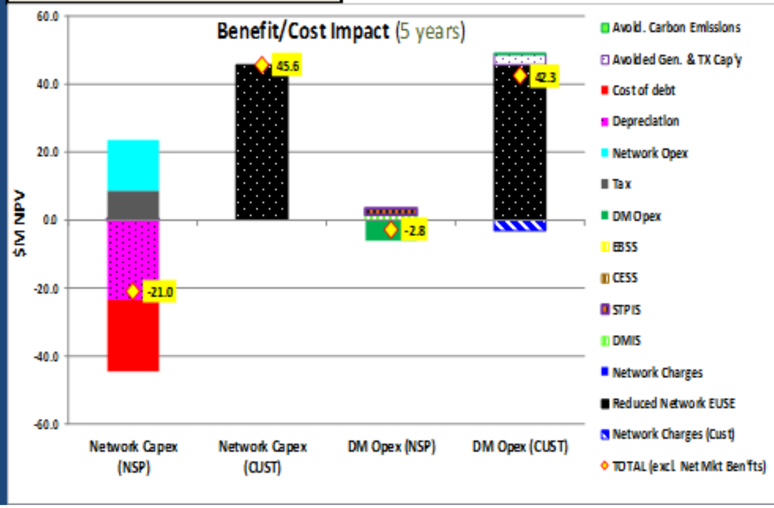
Key Inputs		Default Values	
Regulatory WACC	6.2%	6.2%	
Discount Rate	6.2%	6.2%	=WACC
Regulat'y Return on Equity (pre tax	10.7%	10.7%	
Tax Rate	30%	30%	
Effective STPIS value	50,000	33,460	$/MWh EUSE
Value of Gen. & Transm'n Capacity	62	62	$/kW$_{peak}$/yr
Value of CO_2	10.7	10.7	$/t CO2e
Level of DM Incentive payment	30	0	$/kW$_{peak}$/yr

Regulatory Options Switches		Default
DM Opex Recovery	NO	NO
Include Net Mkt Benefits in Total	NO	NO
Sensitivities		
Reduced Exp. USE - Rule of thumb	YES	1.5x Revenue
Lift DM costs by x%	0%	0%
Reg. CAPEX Gearing (Debt/total)	60%	60%
Solution CAPEX Gearing (debt/total)	60%	60%

30 YEAR Benefit Cost Analysis

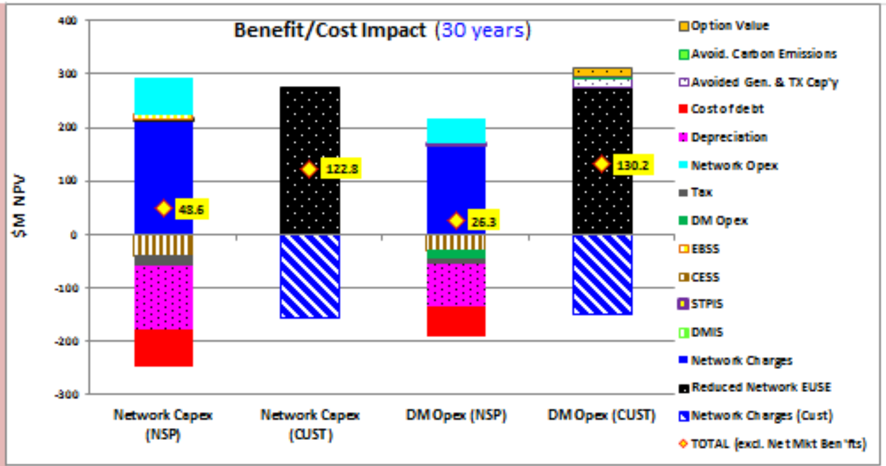


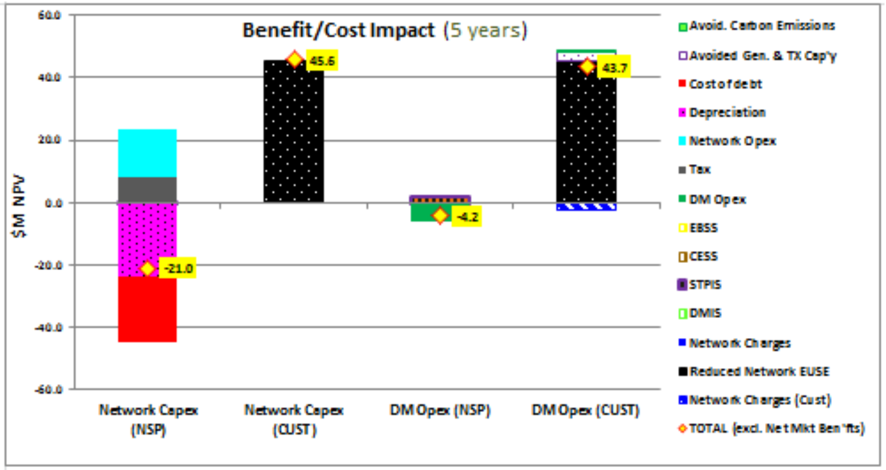
5 YEAR Benefit Cost Analysis



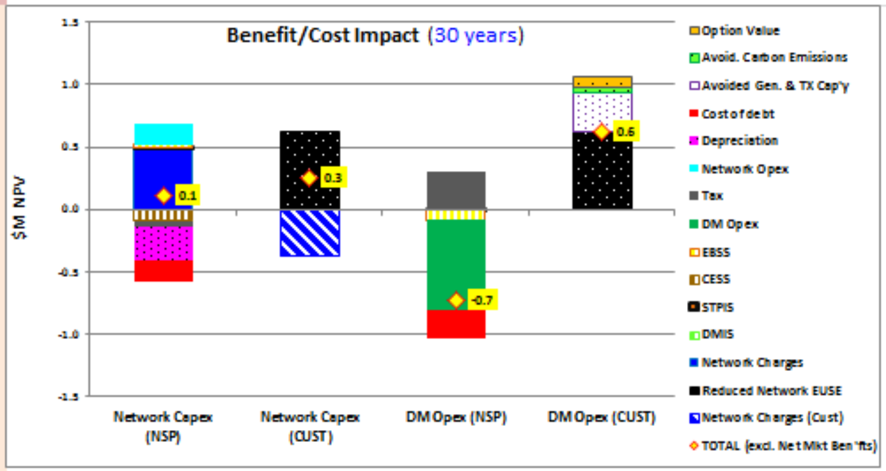
APPENDIX C: RESULTS FROM THE DMIR MODELLING

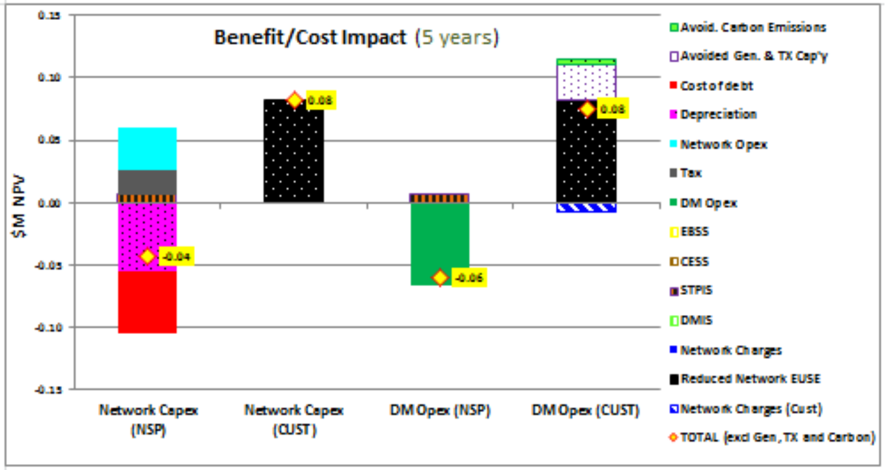
Case 1

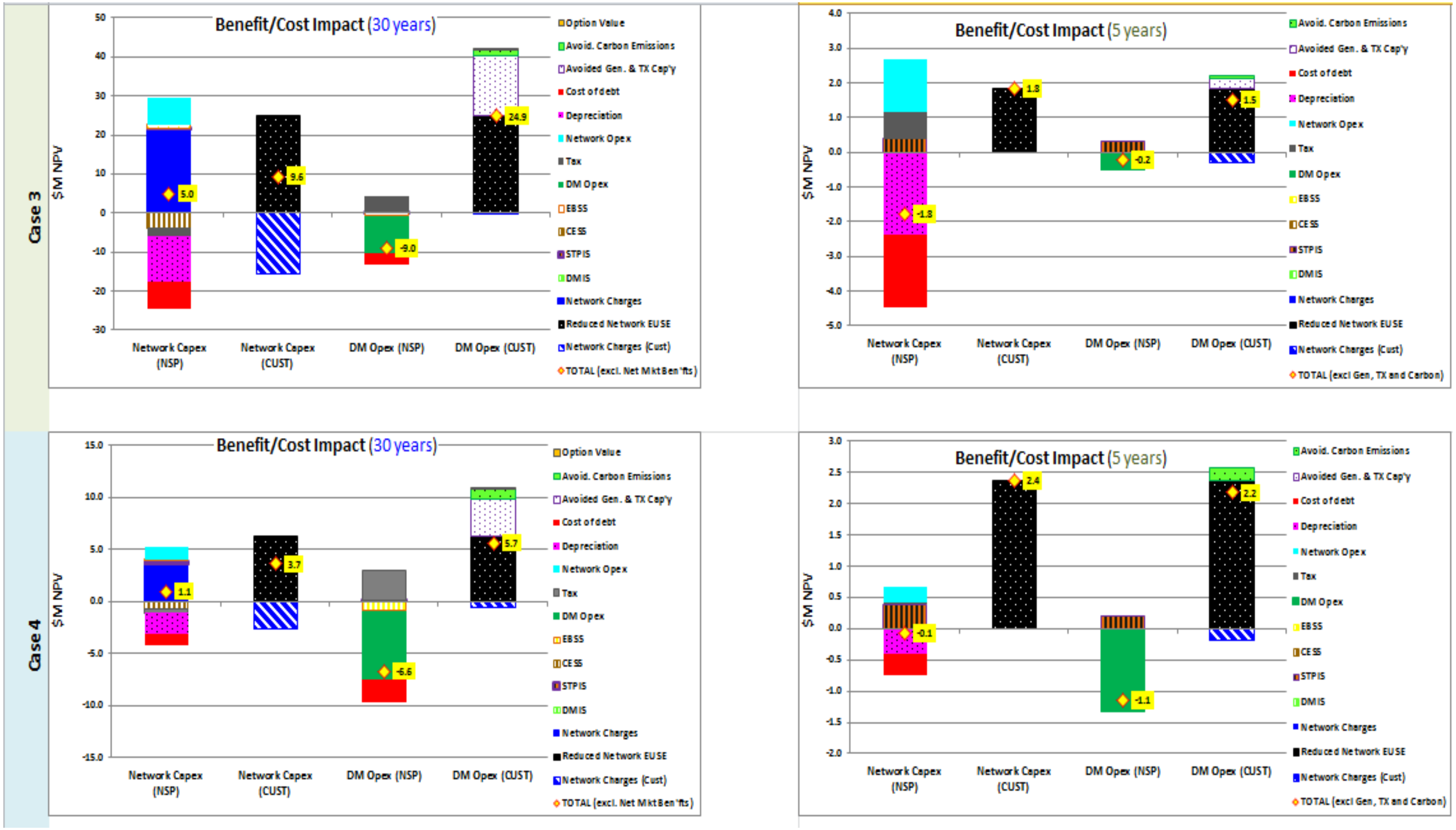




Case 2






Case 3
Case 4
Benefit/Cost Impact (30 years)
Benefit/Cost Impact (5 years)
$M NPV
Network Capex (NSP)
Network Capex (CUST)
DM Opex (NSP)
DM Opex (CUST)
Option Value
Avoid. Carbon Emissions
Avoided Gen. & TX Cap'y
Cost of debt
Depreciation
Network Opex
Tax
DM Opex
EBSS
CESS
STPIS
DMIS
Network Charges
Reduced Network EUSE
Network Charges (Cust)
TOTAL (excl. Net Mkt Ben'fts)
TOTAL (excl Gen, TX and Carbon)

SENSITIVITY ANALYSIS AND BREAKEVEN DMIP

Case 1: 30 year modelling results			Network solution			DM solution			Impact of DM
	DM cost recovery?	**DMIP value**	NSP net profit	NSP return on equity	Customer net benefit	NSP net profit	NSP return on equity	Customer net benefit	
No DMIP (***no*** DM Cost recovery)	**No**	**0**	48.6	10.0%	122.8	26.3	9.2%	130.2	Customers gain, NSP loses
Equalise NSP net profit	**No**	**130**	**48.6**	10.0%	122.8	**48.6**	10.6%	98.4	Customers lose (if NMB ignored), NSPs "neutral"
Equalise NSP return on equity	**No**	**73**	48.6	**10.0%**	122.8	38.8	**10.0%**	112.4	Customers lose (if NMB ignored), NSPs "neutral"
Equalise cust. net benefit *(excl. NMB)*	**No**	**30**	48.6	10.0%	**122.8**	31.5	9.5%	**122.8**	DMIP <$30 benefits customers
Equalise cust. net benefit ***(incl. NMB)***	**No**	**187**	48.6	10.0%	**122.8**	58.4	11.3%	**122.8**	DMIP <$187 benefits customers (NSP gains)
No DMIP (***with*** DM Cost recovery)	**Yes**	**0**	48.6	10.0%	122.8	40.4	10.3%	116.1	Customers lose (if NMB ignored), NSP loses
Equalise NSP net profit	**Yes**	**48**	**48.6**	10.0%	122.8	**48.6**	10.9%	104.4	Customers lose (if NMB ignored), NSPs "neutral"
Equalise NSP return on equity	**Yes**	**n.a. (-30)**	48.6	**10.0%**	122.8	35.5	**10.0%**	123.4	No positive DMIS will benefit customers
Equalise cust. net benefit *(excl. NMB)*	**Yes**	**n.a. (-27)**	48.6	10.0%	**122.8**	35.7	10.0%	**122.8**	No positive DMIS will benefit customers
Equalise cust. net benefit ***(incl. NMB)***	**Yes**	**129**	48.6	10.0%	**122.8**	62.6	11.8%	**122.8**	DMIP <$129 benefits customers (NSP gains)

DMIP = Demand Management Incentive Payment NSP = Network Service Provider NMB = Net market benefits

Case 2: 30 year modelling results			Network solution			DM solution			Impact of DM
	DM cost recovery?	**DMIP value**	NSP net profit	NSP return on equity	Customer net benefit	NSP net profit	NSP return on equity	Customer net benefit	
No DMIP (*no* DM Cost recovery)	**No**	**0**	0.1	10.0%	0.3	-0.7	-0.3%	0.6	Customers gain, NSP loses
Equalise NSP net profit	**No**	**236**	**0.1**	10.0%	0.3	**0.1**	9.7%	-0.6	Customers lose (if NMB ignored), NSPs "neutral"
Equalise NSP return on equity	**No**	**238**	0.1	**10.0%**	0.3	0.1	**10.0%**	-0.6	Customers lose (if NMB ignored), NSPs "neutral"
Equalise custs. net benefit *(excl. NMB)*	**No**	**73**	0.1	10.0%	**0.3**	-0.5	0.8%	**0.3**	DMIP <$73 benefits customers
Equalise cust. net benefit ***(incl. NMB)***	**No**	**159**	0.1	10.0%	**0.3**	-0.2	3.0%	**0.3**	DMIP <$159 benefits customers
No DMIP (***with*** DM Cost recovery)	**Yes**	**0**	0.1	10.0%	0.3	-0.05	2.8%	-0.1	Customers lose, NSP loses
Equalise NSP net profit	**Yes**	**47**	**0.1**	10.0%	0.3	**0.1**	15.6%	-0.3	Customers lose, NSPs "neutral"
Equalise NSP return on equity	**Yes**	**13**	0.1	**10.0%**	0.3	0	**10.0%**	-0.2	Customers lose (if NMB ignored), NSPs "neutral"
Equalise custs. net benefit *(excl. NMB)*	**Yes**	**n.a. (-69)**	0.1	10.0%	**0.3**	-0.3	*N.A. <0*	**0.3**	No positive DMIS will benefit customers
Equalise cust. net benefit ***(incl. NMB)***	**Yes**	**12**	0.1	10.0%	**0.3**	0.0	9.6%	**0.3**	DMIP <$12 benefits customers

DMIP = Demand Management Incentive Payment NSP = Network Service Provider NMB = Net market benefits

Case 3: 30 year modelling results			Network solution			DM solution			Impact of DM
	DM cost recovery?	**DMIP value**	NSP net profit	NSP return on equity	Customer net benefit	NSP net profit	NSP return on equity	Customer net benefit	
No DMIP (***no*** DM Cost recovery)	**No**	**0**	5.0	10.0%	9.6	-9.0	0.3%	24.9	Customers gain, NSP loses
Equalise NSP net profit	**No**	**238**	**5.0**	10.0%	9.6	5.0	21.0%	4.9	Customers lose (if NMB ignored), NSPs "neutral"
Equalise NSP return on equity	**No**	**178**	5.0	**10.0%**	9.6	1.5	10.0%	9.9	Customers gain, NSPs "neutral"
Equalise custs. net benefit *(excl. NMB)*	**No**	**183**	5.0	10.0%	**9.6**	1.8	10.8%	**9.6**	DMIP < $183 benefits customers
Equalise cust. net benefit ***(incl. NMB)***	**No**	**385**	5.0	10.0%	**9.6**	13.7	N.A. >60%	**9.6**	DMIP < $385 benefits customers
No DMIP (***with*** DM Cost recovery)	**Yes**	**0**	5.0	10.0%	9.6	-0.3	8.4%	15.4	Customers gain, NSP loses
Equalise NSP net profit	**Yes**	**90**	**5.0**	10.0%	9.6	5.0	25.1%	7.9	Customers lose (if NMB ignored), NSPs "neutral"
Equalise NSP return on equity	**Yes**	**3**	5.0	**10.0%**	9.6	-0.1	10.0%	15.1	Customers gain, NSPs "neutral"
Equalise custs. net benefit *(excl. NMB)*	**Yes**	**70**	5.0	10.0%	**9.6**	3.8	22.2%	**9.6**	DMIP <$70 benefits customers
Equalise cust. net benefit ***(incl. NMB)***	**Yes**	**272**	5.0	10.0%	**9.6**	15.7	N.A. >60%	**9.6**	DMIP <$272 benefits customers (NSP gains)

DMIP = Demand Management Incentive Payment   NSP = Network Service Provider   NMB = Net market benefits

Case 4: 30 year modelling results			Network solution			DM solution			Impact of DM
	DM cost recovery?	**DMIP value**	NSP net profit	NSP return on equity	Customer net benefit	NSP net profit	NSP return on equity	Customer net benefit	
No DMIP (*no* DM Cost recovery)	**No**	**0**	1.1	10.7%	3.7	-6.6	-0.8%	5.7	Customers gain, NSP loses
Equalise NSP net profit	**No**	**189**	**1.1**	10.7%	3.7	**1.1**	9.9%	-5.4	Customers lose, NSPs "neutral"
Equalise NSP return on equity	**No**	**194**	1.1	**10.7%**	3.7	1.2	**10.7%**	-5.6	Customers lose, NSPs "neutral"
Equalise custs. net benefit *(excl. NMB)*	**No**	**34**	1.1	10.7%	**3.7**	-5.3	-0.2%	**3.7**	DMIP < $34 benefits customers
Equalise cust. net benefit *(incl. NMB)*	**No**	**113**	1.1	10.7%	**3.7**	-2	2.0%	**3.7**	DMIP < $113 benefits customers
No DMIP (*with* DM Cost recovery)	**Yes**	**0**	1.1	10.7%	3.7	-0.5	6.0%	-0.9	Customers lose (if NMB ignored), NSP loses
Equalise NSP net profit	**Yes**	**38**	**1.1**	10.7%	3.7	**1.1**	14.9%	-3.1	Customers lose, NSPs "neutral"
Equalise NSP return on equity	**Yes**	**12**	1.1	**10.7%**	3.7	0.0	**10.7%**	-1.6	Customers lose (if NMB ignored), NSP "neutral"
Equalise custs. net benefit *(excl. NMB)*	**Yes**	**n.a. (-79)**	1.1	10.7%	**3.7**	-3.7	*N.A. <0*	**3.7**	No positive DMIS benefits customers (if NMB ignored)
Equalise cust. net benefit *(incl. NMB)*	**Yes**	**0**	1.1	10.7%	**3.7**	-0.5	6.3%	**3.7**	Customers neutral, NSP loses

DMIP = Demand Management Incentive Payment   NSP = Network Service Provider   NMB = Net market benefits

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